JOHN HAY BIOMEDICAL · MEDICAL INTERVENTIONS · FALL 2026

What We Hope The Year Will Be Like

An imagined semester of Medical Interventions, written as a letter home from a student who does not exist, describing the year we are building toward.

PLEASE READ THIS FIRST

This is fiction. There is no such student. Nothing here is a record of anything that has happened, and no real student, family, grade, or conversation appears anywhere in it.

It is a hope, written in the first person because that is the honest way to describe what a course is supposed to feel like from the inside. The lessons, labs, and assignments are the real planned curriculum. The student, the classmates, the group arguments, the mistakes, and the feelings are invented to show what the plan is meant to produce.

About the partner activities. The Cleveland Clinic onboarding and rotation, the John Carroll ethics Mondays, the research morning, and HOSA events appear here as part of the year we are planning. None of them is confirmed yet. Partner schedules are set outside this building, and any of these may move, change shape, or not run at all. Treat every partner activity in this document as an intention, not a promise.

You keep asking what this class is. It is the one where somebody gets sick and we have to work out what it is, how to prove it, and what to do about it. Seventeen weeks of that. Here is all of it.

WHY I SIGNED UP

I want to go into medicine. I am not sure which part yet, and I have stopped apologizing for that. What I know is that I want to be one of the people who can look at a result and say what it actually means, instead of waiting for someone else to tell me.

My cousin was sick for a long time before anyone named it. Nobody was careless. It was just hard, and the not knowing was its own illness for our whole family. This is the class about the naming.

The weekly rhythm: Monday is the ethics argument, Tuesday is content, Wednesday is the lab, Thursday is analysis, Friday we hand the week in as one packet. It holds for seventeen weeks. Also this course has a lot of days off built into it, which sounds great and mostly means the work compresses around them.

Week 1 · Orientation · August 24 to 28

How the class works, before any of the medicine starts.

MON AUG 24 Welcome, expectations, and how this class works

First day, and he did not hand out a syllabus and read it to us. He put a case on the board, asked what we would need to know to solve it, and let us list things for ten minutes. Then he said the list we just made was the course.

The expectations are short enough to remember. Come in ready, write it down, say where your evidence stops. That last one is going to come up constantly.

> **Turned in:** exit ticket → Exit Tickets folder

TUE AUG 25 How to use the class website

We walked the site: where the day's lesson lives, where the glossary is, where the folder for each kind of work is. Everything I turn in this semester goes to one of a small number of folders, and now I know which is which.

The part I did not expect was the practice section. It is not extra, it is where the WebXam review lives, and it is open from day two.

> **Turned in:** exit ticket → Exit Tickets folder

WED AUG 26 Cornell notes and the 6 Rs

Record, Reduce, Review, Reflect, Recite, Revise. We set up the notebook the way it will stay all semester: notes on the right, questions on the left, summary at the bottom.

He made us do the Reduce step on notes we had just taken, which was uncomfortable, because it showed how much of what I wrote down I could not actually say back.

> **Turned in:** notebook page → Lab Notebooks folder

THU AUG 27 Lab safety, myPLTW, and how to submit

Safety first, and not as a formality. Personal protective equipment, the Safety Data Sheet, and finding the hazard and first aid sections on a real chemical before anyone touched anything. He calls it earning entry to the lab, and that framing works on me.

Then myPLTW logins and a practice submission, so the first real one is not also the first time I have used the system. The first real lab is a week out and it is a gel, so the practice matters.

> **Turned in:** safety agreement and practice submission → Class Records

FRI AUG 28 **WebXam pretest and goal setting**

The pretest is a baseline, not a grade, and he said that before he handed it out and again after. Mine was low and so was everybody's, which was the point.

Then we wrote down a target and one specific habit to get there. Mine is fifteen minutes a night on the practice section. Seventeen weeks to move it.

> **Turned in:** WebXam practice → recorded in Class Records

Week 2 · August 31 to September 2

Unit: launch and safety. Straight into the lab rules.

MON AUG 31 Lab safety and SDS practical

Straight into safety. Personal protective equipment, then the Safety Data Sheet, and we had to find the hazard and first aid sections on a real chemical before we were allowed near anything.

He framed it as earning entry to the lab rather than a rule to obey, which landed better than I expected.

> **Turned in:** exit ticket → Exit Tickets folder

TUE SEP 1 Lab notebook and portfolio

Notebook setup and the portfolio system. Everything I make this year lands in one place with a date and a label, or it does not count.

The portfolio is the thing that gets audited later. He said that twice.

> **Turned in:** notebook page → Lab Notebooks folder

AT HOME, THE NIGHT BEFORE WED SEP 2 Intervention inventory

We listed every kind of medical intervention we could think of, then sorted them: prevent, diagnose, treat, replace. That four-way split is the shape of the whole course.

I had almost nothing under prevent, which turns out to be where most of the actual health impact lives.

> **Turned in:** tracker → recorded in Class Records

AT HOME, THE NIGHT BEFORE WED SEP 2 Launch portfolio submission

First portfolio submission plus a WebXam pretest, cold, in week one. I did badly and so did everybody, which was the point. It is a baseline, not a grade.

> **Turned in:** WebXam practice → recorded in Class Records

> **THAT WEEK AT HOME**
>
> Light. Twenty minutes a night getting the notebook set up and starting the review habit.
>
> He said the students who struggle are the ones who met the content once in August and never went back, so the fifteen minutes starts now.

Unit: the outbreak. Somebody is sick and we do not know why.

> **AFTER SCHOOL · SIGNING UP**
>
> Club sign-ups. HOSA, because it is the one connected to health careers. Chess, because my friend would not let it go. And I asked about the Cleveland Clinic onboarding, which is a real process with a background check and takes weeks, so I started it.

WED SEP 2 Bioethics: isolation vs autonomy ETHICS DAY

When can you confine someone who has done nothing wrong? Quarantine is the state deciding where a person sleeps because of a risk they carry.

I argued for public health and got asked how long is too long, and what happens when the test that justified it turns out to be wrong. I did not have a limit ready and a position without a limit is not really a position.

> **Turned in:** CER → Claim Evidence Reasoning folder

THU SEP 3 Signs vs symptoms

A sign is what someone else can observe. A symptom is what only the patient can report. Fever is a sign, nausea is a symptom.

That distinction runs the whole diagnostic process, because signs can be measured by anyone and symptoms depend entirely on the patient being believed.

> **Turned in:** data table → Data Tables folder

FRI SEP 4 Pathogen categories

Bacteria, viruses, fungi, parasites, and what actually separates them. The practical difference is that an antibiotic works on one of those four and does nothing to the rest.

> **Turned in:** data table → Data Tables folder

TUE SEP 8 Outbreak relationship map

Mapping who contacted whom, when. Our first map was a spaghetti mess until someone suggested ordering it by date instead of by person. Same data, completely different picture, and a cluster appeared.

> **Turned in:** relationship map → Lab Notebooks folder

WED SEP 9 Outbreak CER submission

First real CER of the year. Claim, evidence, reasoning. Mine had a reasoning sentence that just restated the claim in new words, which he says is the most common mistake and I have now made it.

> **Turned in:** CER → Claim Evidence Reasoning folder

> **THAT WEEK AT HOME**
>
> Half an hour a night. Pathogen categories went straight on cards.
>
> Weekend I redid the outbreak map from memory, because the date-ordering trick is the sort of thing you only really own once you have done it twice.

Week 3 · September 10 to 14

Unit: pathogen ID. Computers, not pipettes.

AT HOME, THE NIGHT BEFORE THU SEP 10 **DNA sequencing basics**

How sequencing actually produces a readable order of bases, and why that string is enough to identify an organism.

The idea underneath is that the sequence is a fingerprint nothing else shares.

> **Turned in:** vocabulary → recorded in Class Records

THU SEP 10 **BLAST computer lab** LAB

The whole class in the computer lab running BLAST, which compares an unknown sequence against a global database and ranks what it matches.

Watching an unknown resolve into a named organism in about forty seconds is the first time this course felt like the actual job. The database is public. Anyone can do this.

> **Turned in:** lab report → Lab Reports folder

FRI SEP 11 **E-value and query coverage**

The part that separates a real match from a coincidence. A low E-value means the match is unlikely to be chance, and query coverage tells you how much of your sequence actually lined up.

You can get a confident-looking top hit that covers a tiny fraction of your sequence and means nothing. I would absolutely have been fooled by that yesterday.

> **Turned in:** data table → Data Tables folder

MON SEP 14 **Pathogen-ID report submission**

Full report: sequence, BLAST result, E-value, coverage, and a statement of what the identification does not prove.

> **Turned in:** lab report → Lab Reports folder

> THAT WEEK AT HOME
>
> Forty minutes. E-value and query coverage went on cards because they are exactly the kind of precise definition that shows up on an exam.
>
> Weekend was signs versus symptoms and the pathogen categories again.

Week 4 · September 15 to 18

Unit: ELISA and dilution. Math before the wet lab.

TUE SEP 15 Bioethics: who gets the test ETHICS DAY

When a test is scarce, who is tested first? Symptomatic people, exposed people, essential workers, or whoever asks.

Testing the sickest finds the most disease. Testing the exposed finds it earliest. Those are different goals and the room split hard on which one a test is for.

> **Turned in:** CER → Claim Evidence Reasoning folder

WED SEP 16 Concentration and serial dilution

Serial dilution: each step is the same fixed reduction, so ten of them get you very small very fast. It is the only practical way to get to the concentrations these assays need.

The arithmetic is easy and doing it correctly under time pressure with real tubes is not, which is why we did it on paper first.

> **Turned in:** data table → Data Tables folder

AT HOME, THE NIGHT BEFORE THU SEP 17 Standard curve and lab prep

The standard curve is the thing that makes a colour mean a number. Known concentrations, measured responses, a line through them, and then you read your unknown off the line.

Without it an ELISA tells you something is present. With it you know how much.

> **Turned in:** pre-lab → recorded in Class Records

THU SEP 17 Antigen-antibody and ELISA model

The sandwich: capture antibody, antigen, detection antibody, then something that produces colour. Specificity comes from the antibody only binding its target.

We modeled it dry before touching reagents, which meant Wednesday next week was checking rather than guessing.

> **Turned in:** data table → Data Tables folder

FRI SEP 18 Dilution and ELISA model submission

Dilution calculations, standard curve, model diagram.

> **Turned in:** lab report → Lab Reports folder

THAT WEEK AT HOME

Forty five minutes. I did the dilution math wrong twice before it clicked that each step multiplies rather than subtracts.

Weekend was the standard curve concept out loud until I could explain why you need known values to read an unknown.

Week 5 · September 21 to 24

Unit: the wet ELISA. The real thing.

> AFTER SCHOOL · HOSA
>
> HOSA is choosing competitive events. I am looking at medical terminology because the vocabulary overlaps with what this class already makes me learn, and doing two things with one effort is the only way I get through the week.
>
> Several of us worked the Clinic onboarding together. Much faster than being confused separately.

MON SEP 21 **Bioethics: false results** ETHICS MONDAY

A false negative tells a sick person they are fine. A false positive tells a healthy person they are sick. Which error should a test be designed to avoid?

It depends entirely on what happens next. If the follow-up is a cheap confirmatory test, lean toward catching everything. If it is surgery, do not. The right answer is a property of the whole system, not the test.

> **Turned in:** CER → Claim Evidence Reasoning folder

AT HOME, THE NIGHT BEFORE TUE SEP 22 **Controls and wet-lab plan**

Positive control, negative control, blank. If the negative control comes up positive, every result on that plate is meaningless.

Planning the plate layout in advance, well by well, is most of the work.

> **Turned in:** pre-lab → recorded in Class Records

TUE SEP 22 **Wet ELISA lab** LAB

Actual plate, actual pipettes, actual colour change. My hands were not steady and my volumes were not consistent for the first row, which you can see in the data.

A group near us had a negative control turn positive and had to discard the whole plate. He was almost pleased about it, because they caught it. The dangerous version is the group that never runs a control.

> **Turned in:** data table → Data Tables folder

WED SEP 23 **Specificity vs sensitivity**

Sensitivity is the share of people who have it that the test catches. Specificity is the share of people who do not have it that the test correctly clears. For one given test, moving the cutoff trades them against each other: loosen it and you catch more real cases and also flag more healthy people. What breaks that trade is not a different cutoff, it is a better test.

This is Monday's ethics question with numbers attached. That ordering is not an accident.

> **Turned in:** data table → Data Tables folder

THU SEP 24 **ELISA lab report submission**

Plate layout, raw absorbance, standard curve, unknowns, and a limitations paragraph about my unsteady first row.

> **Turned in:** lab report → Lab Reports folder

> THAT WEEK AT HOME
>
> An hour some nights. Sensitivity and specificity got drilled hard because I keep flipping them.
>
> Weekend I reread my own ELISA data and found an arithmetic error in the standard curve. Fixed before it mattered.

Unit: antibiotics. What works, and what stops working.

FRI SEP 25 **Bioethics: antibiotic stewardship** ETHICS DAY

Should a doctor be allowed to prescribe an antibiotic they believe will not help, because the patient expects one? Refusing costs you the patient. Prescribing costs everyone a little resistance.

It is a tragedy of the commons in a clinic room, and the person paying is not the person deciding.

> **Turned in:** CER → Claim Evidence Reasoning folder

AT HOME, THE NIGHT BEFORE MON SEP 28 **Antibiotic mechanisms**

Cell wall, protein synthesis, DNA replication, membrane. Four things to break, and each class of antibiotic breaks one.

This is also why antibiotics do nothing to viruses. A virus has none of those four targets. It has no cell wall, no ribosomes of its own, no metabolism to poison, and it copies itself inside our own cells using our machinery.

> **Turned in:** vocabulary → recorded in Class Records

MON SEP 28 **Disk diffusion and MIC lab** LAB

Disks of antibiotic on a lawn of bacteria, and you measure the clear zone where nothing grew. For any one antibiotic a bigger zone means this organism is more susceptible to it. You cannot rank two different antibiotics by comparing zones, because each molecule spreads through agar at its own rate, so every zone is read against that drug's own breakpoint table. Getting an actual minimum inhibitory concentration takes a dilution series, not a disk.

Measuring the zone is harder than it sounds because the edge is not always sharp. Two of us measured the same plate and got different numbers, so we agreed on a rule and remeasured everything.

> **Turned in:** data table → Data Tables folder

AT HOME, THE NIGHT BEFORE TUE SEP 29

Resistance and stewardship

How resistance arises and spreads. It is not that individual bacteria learn, it is that the ones that already survive get to reproduce.

Selection pressure is why the length of a course matters. The old line was that stopping early breeds resistance. For most common infections the evidence points the other way: the longer any antibiotic is in you, the longer it selects resistant bacteria in your own normal flora. Take the course you were actually prescribed, and do not assume longer is safer.

> **Turned in:** notebook → Lab Notebooks folder

TUE SEP 29

Antibiotics report submission

Zone measurements, comparison, a claim about which agent was most effective, and the measurement disagreement written into the limitations.

> **Turned in:** lab report → Lab Reports folder

> THAT WEEK AT HOME
>
> Forty five minutes. The four mechanism targets are clean memorization.
>
> Weekend was selection pressure, which I could half explain and now can fully explain.

Week 6 · September 30 to October 2

Unit: culturing. Aseptic technique, then a break.

WED SEP 30 Bioethics: research vs risk ETHICS DAY

Should research that could produce a dangerous organism be done at all, if the same knowledge protects us later?

The honest answer nobody liked is that you cannot know in advance which it will be.

> **Turned in:** CER → Claim Evidence Reasoning folder

AT HOME, THE NIGHT BEFORE THU OCT 1 Aseptic technique

Everything is contaminated unless you actively prevented it. Flame the loop, do not put the lid down, work near the flame, move deliberately.

The whole technique is a set of habits that assume the air is full of things trying to get into your plate. Which it is.

> **Turned in:** pre-lab → recorded in Class Records

THU OCT 1 Culturing and colony data lab LAB

Streak plates and colony counts. My plate had contamination in one quadrant, which is my own technique showing up as data.

Counting colonies is tedious and the number matters, so we counted twice and averaged.

> **Turned in:** data table → Data Tables folder

FRI OCT 2 Mutation, HGT, and superbugs

Bacteria do not only inherit resistance from a parent, they can hand genes sideways to unrelated bacteria. Horizontal gene transfer.

That is why resistance spreads faster than ordinary evolution predicts, and why a resistance gene in one species is a problem for all of them.

> **Turned in:** notebook → Lab Notebooks folder

> **THAT WEEK AT HOME**
>
> Thirty five minutes, lighter with the break.
>
> Weekend I went back to the ELISA unit, three weeks old now and getting fuzzy. Second pass was much faster than the first, which he said would happen.

Week 7 · October 5 to 12

Unit: hearing and vaccines. Two interventions, one week.

AFTER SCHOOL · CHESS

Chess. I keep losing and I am losing slower. Someone pointed out that I plan my own moves and never look at what my opponent is building.

Which is the same failure as my contaminated plate quadrant. I was watching my technique and not watching the environment.

MON OCT 5 Cochlear implant debate ETHICS MONDAY

Whether a cochlear implant should be described as a fix. Some Deaf people do not consider deafness a problem needing solving, and framing the implant as a cure carries a claim about their lives.

This was the first Monday where I realized I had been assuming the medical framing was neutral. It is not. It is a framing, and it belongs to somebody.

> **Turned in:** CER → Claim Evidence Reasoning folder

TUE OCT 6 Audiogram interpretation

Reading an audiogram: frequency across, loudness down, and the shape of the curve tells you what kind of loss it is.

High frequency loss first is the common pattern, which is why consonants go before vowels and people say they can hear you but cannot understand you.

> **Turned in:** data table → Data Tables folder

WED OCT 7 Vaccine and disease-model lab LAB

Modeling how a disease moves through a population and what changes when a fraction is immune.

Watching the model stop spreading before everyone is vaccinated is the clearest possible demonstration of herd immunity. The unvaccinated are protected by the vaccinated.

> **Turned in:** lab report → Lab Reports folder

THU OCT 8 Herd immunity math

The threshold depends on how contagious the disease is. More contagious means a higher fraction needed, and for the most contagious diseases the number is uncomfortably close to everyone.

It is not a slogan, it is a calculation.

> **Turned in:** exit ticket → Exit Tickets folder

AT HOME, THE WEEKEND BEFORE MON OCT 12

Unit 1 tracker check

Portfolio audit against the rubric. Two items were missing labels. Two minutes to fix once found.

> **Turned in:** tracker → recorded in Class Records

> THAT WEEK AT HOME
>
> Forty minutes. The herd immunity threshold formula is exam material.
>
> Weekend was a full pass over Unit 1, since the audit showed me what I had let slide.

Week 8 · October 12 to 16

Unit: genetic testing. It stops being about strangers.

> **WHY I KEEP GOING**
>
> Nine weeks. I nearly dropped this in September when the dilution math kept coming out wrong and everyone else seemed to have it.
>
> What changed it was BLAST week. I put in an unknown sequence and got back a name, and I understood that this is a thing I can actually do. Since then the hard weeks feel like the price rather than the verdict.

MON OCT 12 Genetic privacy debate ETHICS MONDAY

If your genome shows a risk, do your relatives have a right to know? A result about you is partly a result about them.

Hardest Monday so far. I argued for privacy and then had to sit with the fact that under my own rule, somebody could learn they carry something serious and say nothing to a sibling who could act on it. I did not resolve it and my CER says so.

> **Turned in:** CER → Claim Evidence Reasoning folder

TUE OCT 13 Pedigree logic

Reading a family tree for inheritance pattern. Dominant, recessive, sex-linked, each with a signature shape once you know what to look for.

Recessive skipping generations is the one that finally made pedigrees make sense to me.

> **Turned in:** data table → Data Tables folder

WED OCT 14 SNP and PTC case LAB

A small DNA difference changing a real trait, using the PTC tasting case. Most of whether you taste it comes down to three linked base positions in one gene, TAS2R38, inherited together as a set. Even then it is not clean. Some people fall between taster and non-taster.

The size of the change against the size of the effect is the thing that gets you.

> **Turned in:** data table → Data Tables folder

THU OCT 15 Genetic counseling memo

Writing to a family, not to a teacher. Accurate, and readable by someone frightened.

Much harder than the science. I wrote probability as a percentage and my partner said it read as a verdict, so I rewrote it as a frequency out of a hundred families, which is the same number and lands completely differently.

> **Turned in:** CER → Claim Evidence Reasoning folder

AT HOME, THE NIGHT BEFORE FRI OCT 16 **MP1 tracker audit**

Marking period audit. Everything checked against the rubric with a confidence rating I had to be honest about.

> **Turned in:** tracker → recorded in Class Records

> THAT WEEK AT HOME
>
> Forty five minutes. Pedigree patterns are visual and got drawn from memory.
>
> The counseling memo took two sittings because I kept writing like a textbook.

Unit: testing methods. PCR, gels, microarrays.

FRI OCT 16 **Access-to-results debate** ETHICS DAY

Should patients get raw genetic results directly, without a clinician interpreting first? Access against the risk of misreading something frightening.

It is your information. It is also information that is easy to misunderstand in a way that causes real harm. Both things are true.

> **Turned in:** CER → Claim Evidence Reasoning folder

AT HOME, THE NIGHT BEFORE MON OCT 19 **PCR and primers**

Amplifying a tiny amount of DNA into enough to work with, and how the primers decide which region gets copied.

The primers are the specificity. Design them badly and you amplify the wrong thing confidently.

> **Turned in:** notebook → Lab Notebooks folder

MON OCT 19 **Gel electrophoresis lab** LAB

Running a gel. DNA is negatively charged so it moves toward the positive end, and smaller fragments travel further through the gel.

Loading the wells is genuinely difficult. I punctured the bottom of one well and lost that sample. You get one try per well.

> **Turned in:** lab report → Lab Reports folder

TUE OCT 20 **Microarray introduction**

Thousands of expression measurements at once instead of one gene at a time. The scale is the point and also the problem, because with that many measurements some will look significant by chance.

> **Turned in:** vocabulary → recorded in Class Records

AT HOME, THE NIGHT BEFORE WED OCT 21 **Methods quiz**

Quiz on the methods so far. This is where the fifteen minutes a night either paid off or did not. For me it mostly did.

> **Turned in:** WebXam practice → recorded in Class Records

> THAT WEEK AT HOME
>
> Forty five minutes plus quiz prep. I redrew the gel setup with charges labeled until the direction was automatic.
>
> Weekend was a full review pass. About a fifth of my own Cornell questions I could not answer.

Week 9 · October 21 to 23

Unit: gene expression. Two days off, three days of work.

WED OCT 21 Expression data lab LAB

Straight into the lab after two days off, working real expression data. Which genes are turned up, which are turned down, compared against a control.

Expression is the layer between having a gene and it doing anything, which I had never really separated before.

> **Turned in:** data table → Data Tables folder

THU OCT 22 Heat-map claim

Reading a heat map, where colour is intensity and the pattern is the finding. Red up, green down, clustered so similar things sit together.

I made a claim off a striking colour block that turned out to be three genes, which is not a pattern, it is a coincidence with good graphic design.

> **Turned in:** CER → Claim Evidence Reasoning folder

FRI OCT 23 Microarray report submit

Expression table, heat map, claim, and a limitations line about multiple comparisons.

> **Turned in:** lab report → Lab Reports folder

> **THAT WEEK AT HOME**
>
> Compressed. Close to an hour on the two teaching nights, because three days carried five days of content.
>
> I skipped the weekend review pass and felt it the following week. Writing that down so I remember it was a choice with a cost.

Week 10 · October 26 to 29

Unit: gene therapy. Editing, and where to stop.

AFTER SCHOOL · CLEVELAND CLINIC

My Clinic onboarding cleared. Background check, modules, health requirements, all signed off, twelve weeks after I started.

It means in the spring I can be in an actual hospital with an actual badge. This is the first thing school has produced that exists outside of school.

MON OCT 26 Germline editing debate ETHICS MONDAY

Editing a somatic cell affects one person. Editing the germline affects everyone descended from them, none of whom can consent.

That distinction does almost all the ethical work and I had not known it existed two hours earlier.

> **Turned in:** CER → Claim Evidence Reasoning folder

TUE OCT 27 Viral vector chart

Using a virus to deliver a working gene, since delivery is what viruses are already excellent at.

The engineering problem is getting it to the right cells and not triggering an immune response that destroys the therapy.

> **Turned in:** notebook → Lab Notebooks folder

WED OCT 28 CRISPR and reproductive screening

How CRISPR targets a specific sequence, then screening embryos, which is a different thing from editing and gets confused with it constantly.

Selection and modification are not the same act and the ethics of each are different.

> **Turned in:** CER → Claim Evidence Reasoning folder

THU OCT 29 Gene therapy ethics CER

A full CER on where the line sits. Mine argued somatic yes, germline not yet, and had to define not yet in a way that was not just avoidance.

> **Turned in:** CER → Claim Evidence Reasoning folder

THAT WEEK AT HOME

Forty five minutes and I made up the review I skipped.

Weekend was the somatic and germline distinction until I could state it cleanly, because it is the hinge of the entire unit.

Unit: synthesis. Molecule to patient.

FRI OCT 30 Screening equity debate ETHICS DAY

Who gets offered screening, and what happens when the test exists but access does not. A test nobody can reach is not a benefit, it is a statistic about a benefit.

> **Turned in:** CER → Claim Evidence Reasoning folder

AT HOME, THE NIGHT BEFORE WED NOV 4 Molecule-to-patient case packet

Building one case from the molecular level up to the person. Sequence, expression, test result, diagnosis, intervention.

This is the first time all the units have been in one document. I had to reread my own work from September.

> **Turned in:** notebook → Lab Notebooks folder

WED NOV 4 Evidence sort and false results

Sorting our evidence by how much it can carry, and marking which results could be false and what that would do to the conclusion.

A conclusion that collapses if one result is wrong is a fragile conclusion, and you should know that before you commit to it.

> **Turned in:** data table → Data Tables folder

THU NOV 5 Treatment recommendation draft

Recommending an actual intervention, defended with evidence from multiple units, with the uncertainty stated.

Peer review caught that I cited a test result without saying how confident the test itself is.

> **Turned in:** CER → Claim Evidence Reasoning folder

AT HOME, THE NIGHT BEFORE FRI NOV 6 Unit 2 summative

The unit assessment. Nothing on it was a surprise, which is the whole argument for the nightly review.

> **Turned in:** WebXam practice → recorded in Class Records

> **THAT WEEK AT HOME**
>
> An hour most nights with the case packet and the summative in the same week.
>
> Weekend was light on purpose. The holiday break is next.

Week 11 · Thanksgiving week · November 6 to 9

Unit: cancer begins. Two days, then the holiday.

FRI NOV 6 Cancer screening debate ETHICS DAY

Screening finds cancers early. It also finds cancers that would never have caused harm, and those people get treated anyway.

Overdiagnosis was a new idea to me. I had assumed finding more was strictly better.

> **Turned in:** CER → Claim Evidence Reasoning folder

MON NOV 9 Microscopy image baseline LAB

Establishing what normal tissue looks like before looking at anything abnormal. You cannot recognize disordered until you know ordered.

Normal cells sit in a pattern. That is the whole baseline.

> **Turned in:** lab report → Lab Reports folder

> **THAT WEEK AT HOME**
>
> Two nights of twenty minutes, then nothing. He told us not to do MI work over the break, which is the first time all semester he has said that.

Week 12 · November 10 to 17

Unit: cancer treatment. Blunt tools and precise ones.

> WEEKEND · THE RESEARCH EXPERIENCE
>
> The optional research extra credit. A university lab hosted a few of us and a graduate researcher walked us through her project.
>
> Most of her week is troubleshooting and rerunning things that failed, which is exactly what happens to us. And she did not settle on research until her third year of college, which I needed to hear.
>
> She let me pipette. I was better than I was in September and still not good.

TUE NOV 10 Trial-access debate ETHICS DAY

Should a dying patient get an unproven drug? Compassionate access against the fact that if everyone gets it outside the trial, the trial never finishes and nobody learns whether it works.

The cruel part is that both positions are trying to save lives.

> **Turned in:** exit ticket → Exit Tickets folder

THU NOV 12 Biopsy and staging

Staging is not how bad it looks, it is a defined system: size, nodes, spread. Everyone means the same thing by stage two, which is the entire point.

> **Turned in:** exit ticket → Exit Tickets folder

FRI NOV 13 Chemo and radiation LAB

Chemotherapy travels everywhere and leans on cancer cells dividing more often than most normal cells, which is why its side effects land on the other fast-dividing tissues: gut lining, marrow, hair. Radiation also damages DNA in dividing cells, but most of its selectivity is that you aim the beam. That is why chemo side effects are body-wide and radiation side effects are wherever the beam went.

It is a blunt instrument used carefully, not a precise one.

> **Turned in:** CER → Claim Evidence Reasoning folder

MON NOV 16 Targeted therapy

Drugs aimed at something specific to the tumour rather than at division in general. Fewer side effects, but only if the tumour actually has the target, which is why you test first.

This is where the genetics from Unit 2 comes back and pays off.

> **Turned in:** data table → Data Tables folder

TUE NOV 17

Treatment recommendation memo

A recommendation for a specific patient, with the staging, the molecular result, and the uncertainty.

> **Turned in:** CER → Claim Evidence Reasoning folder

THAT WEEK AT HOME

Forty five minutes. Staging is memorization, targeted therapy is conceptual and needed explaining out loud.

Weekend I started the real exam push: every Cornell question from week one forward, marking the ones I could not answer.

Week 13 · November 18 to 23

Unit: organ failure and replacement.

WED NOV 18 Organ-allocation debate ETHICS DAY

Who gets the organ. Sickest first, best match, longest waiting, most likely to survive.

Third allocation debate this course and my position has moved every time. There is no ordering without a bad case attached.

> **Turned in:** exit ticket → Exit Tickets folder

AT HOME, THE NIGHT BEFORE THU NOV 19 Recombinant DNA flow

Putting a human gene into bacteria and having them manufacture the protein. That is where insulin comes from now.

The idea that you can hand a gene to an organism that has never had it and it just reads it is genuinely strange when you stop to think about it.

> **Turned in:** notebook → Lab Notebooks folder

THU NOV 19 Protocol and data stations LAB

Rotating stations, each with a protocol to follow exactly and data to record. Following someone else's protocol precisely is its own skill.

> **Turned in:** data table → Data Tables folder

FRI NOV 20 Tissue-engineering comparison

Growing tissue rather than transplanting it. Scaffold, cells, signals, and the vascular problem that limits how thick anything can be.

Nothing works past a couple of millimetres without a blood supply, and that is the wall the whole field is up against.

> **Turned in:** data table → Data Tables folder

AT HOME, THE WEEKEND BEFORE MON NOV 23 Final tracker evidence packet

Portfolio audit before the break.

> **Turned in:** tracker → recorded in Class Records

> **THAT WEEK AT HOME**
>
> Forty minutes plus the exam list. The unanswered pile is shrinking.
>
> The semester ends soon, so this weekend was consolidation rather than new work.

Week 14 · November 23 to December 1

Unit: cloning. The last week before the break.

MON NOV 23 **Engineered-protein debate** ETHICS MONDAY

Who owns an engineered protein, and what a patent on a therapy does to its price.

The argument for patents is that development is expensive and somebody has to fund it. The argument against is standing in a pharmacy.

> **Turned in:** exit ticket → Exit Tickets folder

AT HOME, THE NIGHT BEFORE TUE NOV 24 **Plasmids and enzymes**

Plasmids as the vehicle, restriction enzymes as the scissors, ligase as the glue. Each enzyme cuts one specific sequence, which is what makes the cut predictable.

> **Turned in:** notebook → Lab Notebooks folder

TUE NOV 24 **Cloning and purification workflow** LAB

The whole workflow end to end: cut, insert, transform, select, express, purify. Every step has a way to fail and a way to check.

> **Turned in:** lab report → Lab Reports folder

MON NOV 30 **Protein expression**

Getting bacteria to actually make the protein, and confirming they did. Present is not the same as correctly folded and functional.

> **Turned in:** notebook → Lab Notebooks folder

AT HOME, THE WEEKEND BEFORE TUE DEC 1 **Cloning workflow quiz**

Quiz, then straight on with the workflow still fresh.

> **Turned in:** WebXam practice → recorded in Class Records

Checkpoint. He asked for fifteen minutes a few times this week on the unanswered pile rather than new work, which is the most reasonable homework I have ever been given.

THAT WEEK AT HOME

Forty five minutes. The cloning workflow is a sequence, so I wrote it out in order until I could do it from memory.

I kept the short sessions going on the unanswered pile, which is down to about a tenth.

Week 15 · Unit 4 opens · December 1 to 4

Unit: protein purification.

TUE DEC 1 Purification overview ETHICS DAY

The problem is separating one protein from thousands of others in the same tube, using whatever makes yours different: size, charge, or what it sticks to.

> **Turned in:** exit ticket → Exit Tickets folder

AT HOME, THE NIGHT BEFORE WED DEC 2 GFP and chromatography

Green fluorescent protein, which is the perfect teaching molecule because you can literally see where it is. Purification stops being abstract when the fraction you want glows.

> **Turned in:** notebook → Lab Notebooks folder

WED DEC 2 Protein-purification lab LAB

Running the column and collecting fractions. Watching the glow move down the column and come out in a specific set of tubes is the most satisfying thing this course has done.

I collected one fraction late and lost part of the peak, which shows up in the yield.

> **Turned in:** data table → Data Tables folder

THU DEC 3 SDS-PAGE gel results

Running the fractions on a gel to see what is actually in each one. Purity is visible as the other bands disappearing.

My best fraction still had two faint contaminant bands, which is honest and went in the report.

> **Turned in:** data table → Data Tables folder

FRI DEC 4 Protein purification lab report

Fractions, gel image, yield calculation, and the late-collection error written into the limitations.

> **Turned in:** lab report → Lab Reports folder

> **THAT WEEK AT HOME**
>
> Back to forty five minutes. Chromatography types went on cards.
>
> Weekend was rebuilding the January restart, since two weeks off costs you more than you expect.

Week 16 · Organ transplant · December 7 to 10

Unit: organ transplant. The kidney, in detail.

MON DEC 7 Allocation debate ETHICS MONDAY

The allocation question again, now with the actual matching criteria in front of us instead of in the abstract.

Having the real criteria made my position sharper and less comfortable.

> **Turned in:** exit ticket → Exit Tickets folder

AT HOME, THE NIGHT BEFORE TUE DEC 8 Nephron and renal data

The nephron in order: filtration, reabsorption, secretion. The kidney filters nearly everything out and deliberately takes most of it back, which is how it keeps such precise control.

> **Turned in:** notebook → Lab Notebooks folder

TUE DEC 8 Dialysis and matching simulation LAB

Dialysis as an external substitute for filtration, then a matching simulation where you allocate organs under the real constraints.

Doing it as a simulation, with actual patients on cards, is completely different from arguing about it on a Monday. Somebody does not get one.

> **Turned in:** data table → Data Tables folder

WED DEC 9 Compatibility and rejection

Blood type, tissue type, and why the immune system attacks a transplant that is helping the person it belongs to. Immunosuppression is a permanent trade.

> **Turned in:** data table → Data Tables folder

THU DEC 10 Allocation CER

A CER defending an allocation decision from the simulation, using the compatibility data.

> **Turned in:** CER → Claim Evidence Reasoning folder

> **THAT WEEK AT HOME**
>
> Forty five minutes. The nephron sequence is exam material and highly ordered, so I drew it until it was automatic.
>
> The simulation stayed with me longer than most of this course.

Unit: tissue engineering. What is coming next.

FRI DEC 11 Emerging-tech debate ETHICS DAY

How much testing before a new technology reaches patients. Speed against safety, and the people harmed by delay are invisible in a way the people harmed by a bad device are not.

> **Turned in:** exit ticket → Exit Tickets folder

AT HOME, THE NIGHT BEFORE MON DEC 14 Scaffolds and stem cells

Scaffold for shape, cells to populate it, signals to tell them what to become. Then the different stem cell types and what each can and cannot do.

> **Turned in:** notebook → Lab Notebooks folder

MON DEC 14 Xenotransplantation and bionics LAB

Animal organs and mechanical replacement as two different answers to the same shortage, with different failure modes and different ethics.

> **Turned in:** data table → Data Tables folder

TUE DEC 15 Design analysis

Analyzing a real device against what the patient actually needs rather than what is technically impressive.

> **Turned in:** notebook → Lab Notebooks folder

WED DEC 16 Design critique

A written critique naming one strength, one weakness, and one thing that would have to be true for it to work.

> **Turned in:** CER → Claim Evidence Reasoning folder

> **THAT WEEK AT HOME**
>
> Forty minutes. Stem cell types are memorization with an easy trap, since potency levels sound alike.
>
> Weekend was consolidation across the whole course, since the portfolio audit is coming.

Week 17 · Final portfolio · December 17 to 18

Unit: final portfolio. The whole semester in one document.

THU DEC 17 Final-ethics debate ETHICS DAY

The last one. We were asked to name one position we had changed across the whole course.

Mine was genetic privacy. I came in certain and I am leaving genuinely unsure, and I now think that is an improvement rather than a failure to decide.

> **Turned in:** exit ticket → Exit Tickets folder

FRI DEC 18 Integrated case checkpoint

One case carried from molecule to patient to intervention, using evidence from every unit.

I pulled from the BLAST identification, the ELISA, the expression data, and the treatment memo. Four units, four months apart, one argument.

> **Turned in:** notebook → Lab Notebooks folder

IN CLASS, FRI DEC 18 Portfolio audit

Every artifact checked against the rubric. Mine was mostly complete and the gaps were all labels and dates rather than missing work, which is its own lesson.

> **Turned in:** tracker → recorded in Class Records

IN CLASS, FRI DEC 18 Gap closeout

Fixing what the audit found. Two hours of small corrections that would have been ten minutes if I had done them at the time.

> **Turned in:** tracker → recorded in Class Records

IN CLASS, FRI DEC 18 Final portfolio submit

Submitted. Seventeen weeks, four units, one portfolio.

In August I could not tell a sign from a symptom. Today I built a case from a DNA sequence to a treatment recommendation and defended every step with my own data.

> **Turned in:** final portfolio → recorded in Class Records

> **THAT WEEK AT HOME**
>
> Two long nights, then done.
>
> The WebXam is still ahead. My unanswered pile is small enough now that it is a list rather than a mountain, which is the entire argument for having started it in August.

Seventeen weeks, four units, one portfolio.

The first thing is how much of this is writing. I expected labs and there were plenty, but the lab is maybe a third. The rest is building a claim that survives someone attacking it, and stating plainly what your evidence cannot prove.

The second thing is that the Mondays are why the rest works. I thought ethics day was a break from content. It is where I learned to hold a position, have it dismantled, and change my mind without feeling like I lost. We argued about allocation three separate times and my answer moved every time.

The third thing is teamwork, which I was worst at. The contaminated quadrant, the punctured gel well, the heat map claim built on three genes, the counseling memo that read like a verdict. Every one was caught by somebody else, and most were failures of checking rather than of knowing.

The fourth thing is that the class is not only the class. HOSA, chess, the Clinic badge, the research morning. The Clinic clearance is the reason the transplant unit hit differently. The research morning is where I learned that a failed run is the job.

What I need from you is what you already do. Ask me what the Monday question was and argue with my answer. The fifteen minutes a night is not negotiable. And if I say I have no homework, ask me what is left in the unanswered pile.

I still want to go into medicine and I still do not know which part, and I have stopped treating that as a problem. What I have now is a set of things I can actually do: identify an unknown, run a controlled assay, read an expression pattern, and say out loud where my evidence stops. My cousin went a long time without a name for what was wrong. I understand now how hard that is, and I also understand that it is work somebody learns how to do. That is what I am doing.

Medical Interventions, 2026 to 2027. Seventeen weeks, four units, a lot of gels. Go Hornets.